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RESULTS OF PHYTOTOXICOLOGY SURVEY

FORMER SANDERSON-HEARLD PROPERTY

PARIS (1995)

JUNE 1996

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PARIS (1995)

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Results of Phytotoxicology Survey - Former Sanderson-Hearld Plant, Paris (1995)

Introduction

On June 29 1995, the Phytotoxicology Section received a request from Cameron Hall of the MOEE West Central Region, Cambridge District office, to conduct additional soil sampling in the vicinity of the former Sanderson-Hearld (S-H) property on Capron Street in Paris. This former cabinet manufacturing company burned down in 1902 and had a large stock of paint on hand at the time of the fire. The property was re-zoned and houses were built on the S-H site in the early 1950s. During a Phytotoxicology complaint investigation on a residential property in the area in 1993, an elevated soil lead level was coincidentally found on the adjacent residential property that had been sampled as a control site (see report: SDB-046-4304-94). Cambridge MOEE staff were notified and a more extensive sampling of area residential properties was requested. In 1994, Phytotoxicology staff collected surface soil from 16 sites, including 11 back lawns and 4 gardens, on 12 area properties. Three properties (5 sites), all in the immediate area of the former S-H property, had soil lead concentrations exceeding the MOEE's Upper Limit of Normal urban guideline (500 µg/g). Residents interviewed in 1994 could recall hardened paint chunks turning up during excavations or while digging their gardens. This suggested that the stored paint in the burned S-H building (1902) was the likely source of the soil contamination (see report: SDB-020-3511-95TM).

On August 3 1995, MOEE staff from the Cambridge office and the Phytotoxicology Section (D. McLaughlin) met with staff of the Brant County Health Unit (BCHU) to discuss the elevated soil lead levels in the Capron St. residential area. The Phytotoxicology Section was requested to sample additional residential sites to fill in the gaps in the data and to more thoroughly define the area and residential properties with elevated soil lead. Tree foliage sampling was also requested as a substitute for air monitoring.

Samples Collected

On August 21 and 22 1995, soil and tree foliage sampling was conducted by Phytotoxicology staff on residential properties in the vicinity of the former S-H company. Each residential property was assigned a property identifier number to maintain the confidentiality of the property owners. These property identifier numbers have no relationship to the actual street numbers, which will be provided to Cambridge MOEE staff.

Surface soil was collected from the front lawns, back lawns and vegetable gardens that were not sampled in 1994 on the residential properties with identifier numbers 1, 2, 3, 4, 6, 7, 8 and 9 (see attached map). All of these properties were situated in the general S-H area. The three residential sites that exceeded the ULN (500 µg/g) in 1994 - the back lawn and garden at Property 2, and the back lawn at Property 4 - were resampled to verify the earlier lead levels in the soil. Additional residential properties (front lawns, back lawns, vegetable gardens) not previously sampled in the general S-H area (Sites 13 through 27) were also sampled. A front lawn at Property 28 downwind of the former industrial Wabco property and a distant control property (30) off Jane St. completed the 1995 sampling.

The back lawn at Property 2 contained a shiny, blackish, cinder-like material at about a 10 cm depth in the soil. This material was sampled. The adjacent garden on the same property was inspected at some locations to about a 30 cm depth with a shovel. The soil that was turned up contained a similar cinder-like material plus pieces of rock, brick and other objects (glass, wire, iron railing). The inspections on this property did not uncover any obvious paint chunks in the soil. The cinder-like material was also present in the soil on some neighbouring properties (eg. 3 and 4).

Surface soil in each front and back lawn was collected at a depth of 0-5 cm, while gardens were sampled to a 15 cm depth, the usual tilling depth. Triplicate soil samples from each site were collected using standard procedures. The investigator had intended to collect depth samples from some of the properties with elevated lead levels, but this was not possible because of the dry and hard subsoil conditions in August.

In addition, Norway or sugar maple foliage was collected from a tree in the backyard of Properties 2 and 4 (both sites on the north side of Capron St.) and in the front yard of Property 21 across the road from Property 2. Maple foliage also was sampled in the front yard of Properties 28 (Norway) and 29 (sugar). These sites were neighbouring the commercial-industrial areas and the former Wabco property north of Capron Street. Corresponding foliage samples also were sampled from a control property (30) on Jane St. At all foliage sites, duplicate samples were collected from middle branches facing the former Wabco site (see map). The foliage sampling was conducted to determine whether a source of lead emissions currently exists in the survey area.

All soil and vegetation samples were returned to the Phytotoxicology Section processing laboratory. Here, the samples were dried and ground (foliage) or sieved (soil) and then stored in glass jars. They were then submitted to the MOEE's Laboratory Services Branch for analysis of lead and other metals.

Analytical Results

The soil analysis results are summarized in Tables 1 and 2, while the foliar results are shown in Table 3. All data units are reported as µg/g (micrograms per gram, commonly referred to as ppm or parts per million). Table 1 summarizes all residential soil lead results that were obtained in 1994 and 1995. The 1994 survey results are shown in Appendix A.

The results in the tables are compared with the Upper Limit of Normal (ULN) or Ontario Typical Range (OTR) urban guidelines developed by the Phytotoxicology Section. ULNs reflect the expected upper limit of normal concentrations in urban areas not influenced by point sources of emissions (see Appendix B). OTRs are similar to ULNs but they are developed from a more extensive province-wide data base and so far they are only available for surface soil from parkland (see Appendix C). A level in excess of the ULN or OTR indicates the likely presence of a source of contamination. The soil results in Tables 1 and 2 also show the MOEE soil clean up guidelines that apply when contaminated lands are decommissioned for residential use. These guidelines are based on the most sensitive receptors: human health (cadmium, lead), animal health (copper, molybdenum), and plant health (remaining elements).

Lead and Other Metals in Soil

The results for the sites that were resampled in 1995 verified the elevated lead concentrations that were previously encountered on these properties. All sampling sites in the backyard at property 2 (lawn, vegetable garden, flower bed) exceeded the ULN, especially the flower bed (3,167 µg/g). The soil lead level of the garden at Property 3 and of the back lawn at Property 4 also was above the ULN. The MOEE soil cleanup guideline (200 µg/g) was exceeded at 13 sites on six residences (1, 2, 3, 4, 6, 7), all of which were situated in the general S-H area. This pattern is an indication that the elevated lead levels on these properties are of historical origin and are related to emissions and/or closure activities associated with the former S-H plant.

Lead concentrations of greater than 200 µg/g in soil may have adverse health implications, specifically for children, and where vegetables are consumed from home gardens. However, this guideline (200 µg/g) is not a mandatory action level, which if exceeded, requires clean-up. In the case of sites found to be contaminated but are not undergoing decommissioning or land use change, a decision on remedial action is based on a number of factors, including blood lead levels of area residents (see attached Lead Information Sheet: Frequently Asked Questions about Lead in Soil - Appendix D).

The back lawn at Properties 2 and 4 and the garden at Property 3 exceeded the ULN for barium (Table 2). The garden at Property 3 also had an elevated strontium level relative to the OTR. However, adverse effects would not be expected as these barium and strontium levels were only marginally higher than the ULN/OTR guidelines and the barium levels were well below the soil cleanup guideline (a strontium cleanup guideline not established). With the exception of the elevated lead results, all other soil metal concentrations in the survey area were within a normal or typical range.

The cinder-like material collected at Property 2 had elevated barium, copper and lead levels relative to the ULNs. However, of these results, only the lead levels in this material exceeded the soil

cleanup guidelines.

Foliage Results

The maple foliage collected from Properties 2, 4, and 21 in the immediate S-H area, and from Properties 28 and 29 that were closer to the existing commercial-industrial area to the north, contained only trace lead concentrations (range 0.8 T-1.0 T μg/g). These tree foliage lead concentrations were well below both the urban ULN (60 μg/g) and the rural ULN (30 μg/g). This is a further indication that the elevated lead levels found in the soil were of historical origin and not related to a current source.

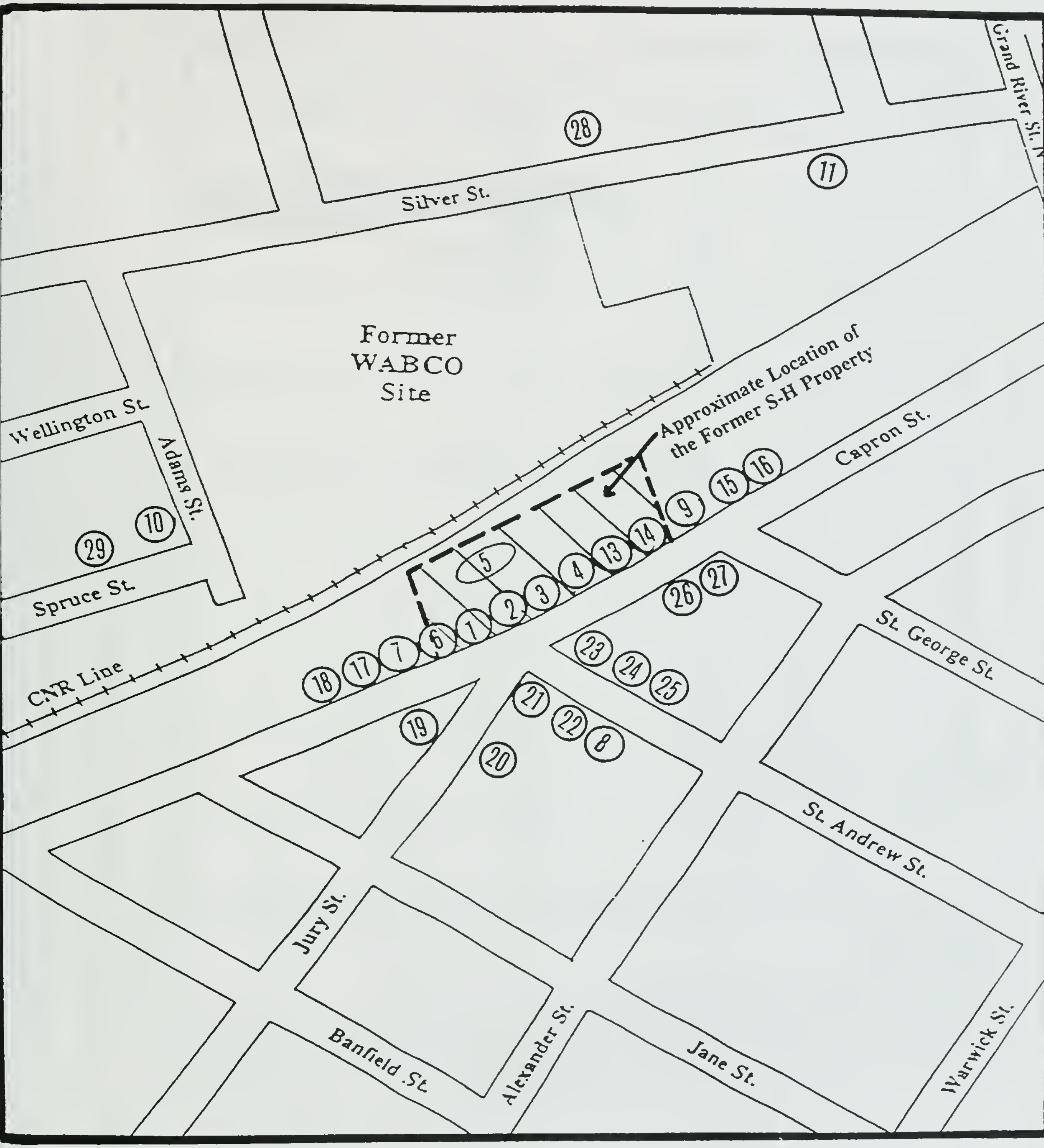
The foliage samples had normal elemental levels relative to the control data and/or the ULNs, with the exceptions of barium and strontium at Properties 2 and 4. These foliage sites, especially Property 4, had moderately elevated barium and strontium levels compared to the control levels (ULNs not established). Since barium was elevated in the soil at both sites, the elevated barium levels in the foliage were likely due to root uptake from the soil. The elevated strontium levels in the foliage also are suspected to be related to soil conditions. Both properties had normal strontium levels in the surface soil (0-5 cm), but the tree roots could have been exposed to elevated strontium levels at depth in the subsoil (samples not collected). The fact that neighbouring Property 21 (across from Property 2) had normal concentrations of barium and strontium in the foliage (as well as in the soil) is a further indication that the elevation in the foliage at Properties 2 and 4 was related to soil conditions in these backyards, not the air. Both maple trees (Properties 2 and 4) appeared healthy, an indication that they were not adversely affected by the marginally elevated soil barium and strontium concentrations.

Conclusions

The combined 1994 and 1995 results revealed that soil lead concentrations on six residential properties (1, 2, 3, 4, 6, 7) in the general area of the former S-H plant, relative to the MOEE guidelines, were elevated and are a potential health concern. Barium, copper and strontium also were elevated at a few sites, but adverse effects would not be expected. This is because the barium and copper soil cleanup guidelines were not exceeded and the single elevated strontium soil level was only slightly above the MOEE OTR guideline. The normal lead levels in the tree foliage samples confirms that the elevated soil lead levels are historical. The elevated barium and strontium levels in foliage at Properties 2 and 4 are suspected to be attributable to root uptake from the soil.

The soil and foliage results indicate that historical emissions and/or closure activities associated with the former S-H plant were the origin of the elevated soil lead concentrations on the affected residential properties on Capron Street. The attached lead information sheet outlines the measures that can be taken by a property owner to reduce exposure to lead in the soil.

Properties/Sites Sampled in the Area of the Former S-H Property, Paris - 1994 and 1995



Properties 12 & 30 not shown

Sketch Not to Scale

Table 1: Summary of Residential Soil Lead Results: Former Sanderson-Hearld Property, Paris (1994 and 1995).

Property Identifier	Street	Lead Concentration* in Soil		
		Front Lawn	Back Lawn	Garden
Residential Sites in S-H Area				
1	Capron	187	330**	447**
2	Capron	173	1200	803
2	Capron		3400***	3167** - Flwr Gd
3	Capron	190	437**	737
4	Capron	380	760	
6	Capron	143	423**	330
6	Capron		277 - W lawn	
7	Capron	280	120**	
9	Capron	117	150**	64
13	Capron	91	95	
14	Capron	81	90	
14	Capron		87 - W lawn	
15	Capron	29	43	
16	Capron	28	28	
17	Capron	34	58	73
18	Capron	75	117	86
26	Capron	50	72	
27	Capron	40		
8	St. Andrews	35	58**	
21	St. Andrews	41	57	
22	St. Andrews	23	84	31
23	St. Andrews	33	77	
24	St. Andrews	180	150	
25	St. Andrews	24	167	
19	Jury	47	33	
20	Jury	42		
Residential Sites More Distant				
12	Jane		67	67
30	Jane	85		
11	Silver		31	
28	Silver	27		
10	Spruce		93	
ULN Guideline			500	
SCUG Guideline			200	

*ug/g, dry weight, mean of duplicate samples and analysis.

** Result in 1994 (not sampled in 1995). *** Black cinder-like material at 10-15 cm depth.

ULN - Phytotoxicology Section Upper Limit of Normal (ULN) guideline, see Appendix B.

SCUG - MOEE soil clean-up guideline. Flwr Gd. - Flower garden

Note : Results shaded exceed ULN, while underlined, bolded, values exceed SCUG.

Table 2: Residential Soil Analysis Results: Former Sanderson-Hearld Property, Paris (1995).

Property Identifier	Street	Sampling Site	Soil Concentration* Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Strontium	Vanadium	Zinc
1	Capron	Fr. Lawn	76	DL	0.7 T	18	6	20	187	DL	12	21	31	123
2	Capron	Fr. Lawn	94	DL	0.7 T	16	6	18	173	DL	13	18	29	110
2	Capron	Bk. Lawn	210	0.4 T	1.5	20	12	57	1200	0.8 T	22	43	31	197
2	Capron	Cinder 10 cm	450	0.6 T	2.6	26	21	106	3400	2.1 T	42	63	33	193
2	Capron	Garden	150	DL	0.9 T	20	9	52	803	1.1 T	18	45	27	250
3	Capron	Fr. Lawn	101	DL	0.9 T	23	7	26	190	DL	15	21	31	143
3	Capron	Garden	193	DL	1.1	18	7	31	737	DL	13	81	26	210
4	Capron	Fr. Lawn	112	0.4 T	0.8 T	20	7	23	380	0.5 T	16	37	33	147
4	Capron	Bk. Lawn	200	0.7 T	0.8 T	22	8	32	760	0.6 T	18	56	36	210
6	Capron	Fr. Lawn	84	DL	0.7	20	7	19	143	DL	13	18	33	147
6	Capron	W. Side Lawn	123	0.4 T	0.8	22	7	49	277	0.4 T	15	26	36	227
6	Capron	Garden	120	DL	1 T	19	7	34	330	DL	15	39	34	250
7	Capron	Fr. Lawn	101	DL	0.8 T	21	7	21	280	0.4 T	13	24	34	170
9	Capron	Fr. Lawn	95	DL	0.7 T	19	7	18	117	DL	14	20	34	123
9	Capron	Garden	82	DL	0.7 T	18	6	17	64	DL	12	28	35	120
13	Capron	Fr. Lawn	79	DL	0.8 T	19	7	20	91	DL	15	18	34	120
13	Capron	Bk. Lawn	82	0.6 T	0.9 T	20	8	22	95	DL	15	18	37	127
14	Capron	Fr. Lawn	81	DL	0.9 T	19	7	19	81	DL	15	21	34	98
14	Capron	Bk. Lawn	110	DL	1.0 T	19	7	24	90	DL	14	21	32	147
14	Capron	W Side Lawn	77	DL	0.6 T	19	7	20	87	0.4 T	13	15	33	107
15	Capron	Fr. Lawn	62	DL	0.7 T	20	6	16	29	DL	13	14	34	84
15	Capron	Bk. Lawn	72	DL	0.6 T	20	7	22	43	DL	13	15	33	99
16	Capron	Fr. Lawn	59	DL	0.6 T	18	6	15	28	DL	13	13	32	78
16	Capron	Bk. Lawn	59	DL	0.7 T	19	6	17	28	0.4 T	13	16	33	79
17	Capron	Fr. Lawn	57	DL	0.6	17	6	14	34	DL	11	19	29	79
17	Capron	Bk. Lawn	61	0.4 T	0.6	21	6	24	58	0.4 T	14	21	36	120
17	Capron	Garden	72	0.4 T	0.9 T	21	6	40	73	DL	14	30	37	127
18	Capron	Fr. Lawn	80	DL	0.7 T	18	6	19	75	DL	12	22	34	110
18	Capron	Bk. Lawn	94	0.5 T	0.9 T	20	6	28	117	0.5 T	14	22	33	133
18	Capron	Garden	83	DL	0.8 T	16	4	25	86	0.4 T	11	36	29	137
26	Capron	Fr. Lawn	66	DL	0.7 T	18	6	18	50	DL	12	22	33	107
26	Capron	Bk. Lawn	80	0.4 T	0.9 T	20	7	23	72	0.4 T	15	22	35	147
27	Capron	Fr. Lawn	61	DL	0.7 T	17	6	20	40	DL	13	21	34	97
19	Jury	Fr. Lawn	75	DL	0.7 T	18	6	18	47	0.4 T	13	17	32	105
19	Jury	N. Side Lawn	61	DL	0.6	18	6	17	33	DL	13	19	33	92

Table 2: Residential Soil Analysis Results: Former Sanderson-Hearld Property, Paris (1995).

Property Identifier	Street	Sampling Site	Soil Concentration*											
			Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Strontium	Vanadium	Zinc
20	Jury	Park Lawn	68	DL	0.7 T	17	6	16	42	DL	12	17	31	88
8	St. Andrews	Fr. Lawn	61	DL	0.7 T	21	6	16	35	DL	12	20	35	79
21	St. Andrews	Fr. Lawn	63	DL	0.7 T	18	6	16	41	0.4 T	13	16	37	92
21	St. Andrews	Bk. Lawn	81	DL	0.8 T	20	6	21	57	0.4 T	13	22	34	197
22	St. Andrews	Fr. Lawn	57	DL	0.7 T	17	5	19	23	0.4 T	11	41	29	84
22	St. Andrews	Bk. Lawn	79	DL	0.9 T	18	7	22	84	DL	14	30	30	137
22	St. Andrews	Garden	59	DL	0.6 T	18	6	19	31	0.4 T	12	21	32	98
23	St. Andrews	Fr. Lawn	59	DL	0.8 T	19	6	17	33	DL	11	31	31	85
23	St. Andrews	Bk. Lawn	110	DL	1.1	20	7	29	77	0.5 T	13	29	32	263
24	St. Andrews	Fr. Lawn	78	DL	0.9 T	19	7	18	180	DL	14	14	32	127
24	St. Andrews	Bk. Lawn	117	0.4 T	0.8 T	21	8	24	150	0.4 T	15	16	34	163
25	St. Andrews	Fr. Lawn	53	DL	0.6 T	18	6	14	24	DL	11	20	31	69
25	St. Andrews	Bk. Lawn	133	DL	1.4	31	7	26	167	DL	13	22	31	153
28	Silver	Fr. Lawn	56	DL	0.7 T	17	6	16	27	DL	12	16	29	74
30	Jane	Fr. Lawn	67	0.6 T	0.8 T	20	7	27	85	DL	15	26	37	137
ULN or OTR			180**	0.97**	4	50	25	100	500	3	60	78**	70	500
Clean-up Guideline			1000	5	4	1000	50	200	200	5	200	NG	250	800

* ug/g, dry weight, mean of duplicate samples and analysis. T - Trace measurable amount, interpret with caution.

DL - Concentration at or below analytical detection limit. NG - Guideline not established.

ULN - Phytotoxicology Section Upper Limit of Normal urban guideline, see Appendix B.

**OTR (Appendix C) substituted for elements where ULN not established.

Note: Shaded values exceed ULN, while underlined, bold, values exceed clean-up guideline.

Table 3: Maple Foliage Metal Concentrations: Former Sanderson-Hearld Property, Paris (1995).

Parameter	Property Identifier, Maple Species, and Concentration* in Foliage							ULN
	Sites Close to Former S-H			Sites More Distant				
	2	4	21	29	28	Distant Control		
	Sugar	Norway	Sugar	Sugar	Norway	Sugar	Norway	
Barium	25	33	7	10	8	7	8	NG
Beryllium	DL	DL	DL	DL	DL	DL	DL	NG
Boron	69	62	26	42	48	27	44	175
Cadmium	DL	DL	DL	0.1 T	DL	DL	DL	2
Chromium	DL	DL	DL	DL	DL	DL	DL	8
Cobalt	DL	DL	DL	DL	DL	DL	DL	2
Copper	4	6	3	2 T	11	5	8	20
Lead	0.8 T	1.0 T	DL	0.8 T	0.9 T	DL	DL	60
Molybdenum	DL	DL	DL	DL	DL	0.3 T	0.3 T	1.5
Nickel	DL	DL	DL	DL	DL	DL	DL	7
Strontium	41	83	26	36	31	24	28	NG
Vanadium	DL	DL	DL	DL	DL	DL	DL	5
Zinc	26	24	12	13	16	15	15	250

*ug/g, dry weight, mean of duplicate samples and analysis.
T - Trace amount, interpret with caution. DL - Level at or below analytical detection limit.
ULN - Phytotoxicology Section Upper Limit of Normal urban guideline, see appendix B.
NG - Guideline not established.

Appendix A

Concentrations[1] of 22 Inorganic Elements in Soils at 12 Survey Sites in the Vicinity of the Former Wabco Industries Property, Paris.

Survey Site Number	Survey Site Location	Sample Site Description	Pb	Ti	As	Hg	Sb	Cd	Co	Cr	Zn	Sr	V
1	Capron St.	Rear lawn	330	3,800	7	0.05T	0.4T	0.7T	7	19	130	18	34
		Rear garden	447	3,600	8	0.05T	0.9T	1.0T	8	20	200	21	29
2	Capron St.	Flower garden	3,167	3,400	6	0.18	9	1.1T	8	22	383	60	29
		Rear garden	900	3,300	10	0.14	6	0.9T	10	18	253	54	29
		Rear lawn	823	3,700	8	0.15	2	1.2	10	19	270	34	31
3	Capron St.	Rear lawn	437	3,700	7	0.06T	2	1.0T	7	26	127	42	30
4	Capron St.	Rear lawn	667	3,900	9	0.09	3	0.8T	8	21	207	58	34
5	Behind Capron St. properties	CNR right-of-way	623	3,900	8	0.17	1T	1.3T	7	19	307	26	30
6	Capron St.	Rear lawn	423	3,900	8	0.17	1T	0.6T	8	21	170	18	32
7	Capron St.	Rear lawn	120	3,500	6	0.18	0.6T	0.5T	6	18	147	24	29
8	St. Andrew St.	Rear lawn	58	3,700	9	0.17	0.6T	0.7T	7	21	127	21	36
9	Capron St.	Rear lawn	150	3,800	8	0.11	0.6T	0.6T	7	19	210	36	34
10	Spruce St.	Side & rear lawn	93	3,700	13	0.11	1.4	0.7T	7	21	213	37	31
11	Silver St.	Rear lawn	31	4,000	4	0.04T	0.4T	0.5T	7	18	103	11	32
12 (Control)	Jane St.	Rear lawn	67	3,900	4	0.09T	0.4T	0.5T	7	18	98	12	34
		Rear garden	67	3,600	13	0.08T	0.6T	0.8T	8	27	173	25	46
ULN			500		20	0.5	8	4	25	50	500		70
OTR_{98}				4,800								78	

[1] micrograms per gram (ug/g) - dry weight, triplicate sample analysis. aluminum, calcium and iron results given in percent (%) - dry weight, triplicate analysis.

ULN Upper Limit of Normal Guidelines - 0-5 cm urban soils (appendix 1).

OTR Ontario Typical Range$_{98}$ Provisional Guidelines - Old Urban Parkland (appendix 2)

T - a measurable trace amount, interpret with caution.

DL - at or below analytical detection limit.

Shaded areas contain data in excess of the guideline:

MOEE lead guideline recently revised to 200 ug/g.

Appendix B

Derivation and Significance of the MOEE Phytotoxicology "Upper Limits of Normal" Contaminant Guidelines.

The MOEE Upper Limits of Normal (ULN) contaminant guidelines represent the expected maximum concentration in surface soil, foliage (trees and shrubs), grass, moss bags, and snow from areas in Ontario not exposed to the influence of a pollution source. Urban ULN guidelines are based on samples collected from urban centres, whereas rural ULN guidelines were developed from non-urbanized areas. Samples were collected by Phytotoxicology staff using standard sampling procedures (reference: *Ontario Ministry of the Environment. 1989. Ontario Ministry of the Environment "Upper Limit of Normal" Contaminant Guidelines for Phytotoxicology Samples. Phytotoxicology Section, Air Resources Branch: Technical Support Sections NE and NW Regions, Report No. ARB-138-88-Phyto. ISBN: 0-7729-5143-8.*). Chemical analyses were conducted by the MOEE Laboratory Services Branch.

The ULN is the arithmetic mean plus three standard deviations of the suitable background data for each chemical element and parameter. This represents 99% of the sample population. This means that for every 100 samples that have not been exposed to a pollution source, 99 will fall within the ULN.

The ULNs do not represent maximum desirable or allowable limits. Rather, they are an indication that concentrations that exceed the ULN may be the result of contamination from a pollution source. Concentrations that exceed the ULNs are not necessarily toxic to plants, animals, or people. Concentrations that are below the ULNs are not known to be toxic.

ULNs are not available for all elements. This is because some elements have a very large range in the natural environment and the ULN, calculated as the mean plus three standard deviations, would be unrealistically high. Also, for some elements, insufficient background data is available to confidently calculate ULNs. The MOEE Phytotoxicology ULNs are constantly being reviewed as the background environmental data base is expanded. This will result in more ULNs being established and may amend existing ULNs.

Appendix C

Derivation and Significance of the Ontario Ministry of Environment and Energy (MOEE) "Ontario Typical Range" of Chemical Parameters in Soil, Vegetation, Moss bags and Snow

The MOEE "Ontario Typical Range" (OTR) guidelines are being developed to assist in interpreting analytical data and evaluating source-related impacts on the terrestrial environment. The OTRs are used to determine if the level of a chemical parameter in soil, plants, moss bags, or snow is significantly greater than the normal background range. An exceedence of the OTR_{98} (*the OTR_{98} is the actual guideline number*) may indicate the presence of a potential point source of contamination.

The OTR_{98} represents the expected range of concentrations of chemical parameters in surface soil, plants, moss bags, and snow from areas in Ontario not subjected to the influence of known point sources of pollution. The OTR_{98} represents 97.5 percent of the data in the OTR distribution. This is equivalent to the mean plus two standard deviations, which is similar to the previous MOEE "Upper Limit of Normal" (ULN) guidelines. In other words, 98 out of every 100 background samples should be lower than the OTR_{98}.

The OTR_{98} may vary between land use categories even in the absence of a point source of pollution because of natural variation and the amount and type of human activity, both past and present. Therefore, OTRs are being developed for several land use categories. The three main land use categories are Rural, New Urban, and Old Urban. Urban is defined as an area that has municipal water and sewage services. Old Urban is any area that has been developed as an urban area for more than 40 years. Rural is all other areas. These major land use categories are further broken into three subcategories; Parkland (which includes greenbelts and woodlands), Residential, and Industrial (which includes heavy industry, commercial properties such as malls, and transportation rights-of-way). Rural also includes an Agricultural category.

The OTR guidelines apply only to samples collected using standard MOEE sampling, sample preparation, and analytical protocols. Because the background data were collected in Ontario, the OTRs represent Ontario environmental conditions.

The OTRs are not the only means by which results are interpreted. Data interpretation should involve reviewing results from control samples, examining all the survey data for evidence of a pattern of contamination relative to the suspected source, and where available, comparison with effects-based guidelines. The OTRs are particularly useful where there is uncertainty regarding local background concentrations and/or insufficient samples were collected to determine a contamination gradient.

OTRs are also used to determine where in the anticipated range a result falls. This can identify a potential concern even when a result falls within the guideline. For example, if all of the results from a survey are close to the OTR_{98} this could indicate that the local environment has been contaminated above the *anticipated average,* and therefore the pollution source should be more closely monitored.

The OTRs identify a range of chemical parameters resulting from natural variation and normal human activity. ***As a result, it must be stressed that values falling within a specific*** OTR_{98} ***should not be considered as acceptable or desirable levels; nor does the*** OTR_{98} ***imply toxicity to plants, animals or humans.*** Rather, the OTR_{98} is a level which, if exceeded, prompts further investigation on a case by case basis to determine the significance, if any, of the above normal concentration. Incidental, isolated or spurious exceedences of an OTR_{98} do not necessarily indicate a need for regulatory or abatement activity. However, repeated and/or extensive exceedences of an OTR_{98} that appears to be related to a potential pollution source does indicate the need for a thorough evaluation of the regulatory or abatement program.

The OTR_{98} supersedes the Phytotoxicology ULN guideline. The OTR program is on-going. The number of OTRs will be continuously updated as sampling is completed for the various land use categories and sample types.

Ministry of Environment and Energy

FOR YOUR information

NOVEMBER 1995

Frequently asked questions about lead in soil

WHAT IS LEAD?

Lead is a toxic heavy metal that is released into the environment through industrial sources, the previous use of leaded gasoline (now banned), disposal of lead wastes and the peeling or flaking of lead-based paint. Ontario residents are exposed every day to varying amounts of lead. Only about one per cent of our daily exposure to lead is from natural sources.

HOW MUCH LEAD IS THERE IN OUR SOIL?

Lead in surface soil in residential communities is often higher than 200 parts per million (ppm). In older, larger urban residential areas like Toronto, lead in soil may exceed 500 ppm, even when there is no local industrial source. Lead in soil in smaller communities is usually below 100 ppm.

IS LEAD HARMFUL?

Young children (aged six months to four years) are most at risk from lead exposure. Children take in an average of 80 milligrams of soils and dust (a volume of soil about the size of a grain of rice) each day while they play and, depending on the concentration of lead in soil, may develop high levels of lead in their blood.

In addition to direct exposure to soil, lead-contaminated soil contributes to the levels of lead found in dust within the home. Lead-based paints and industrial pollution can also contribute to lead dust in the home. Soil and dust are considered to be the major routes of exposure to lead for children.

The Ministry of Environment and Energy advises that there is minimal risk from exposure to soil with lead levels below 200 ppm.

HOW ARE CHILDREN AFFECTED?

High levels of lead in children may result in reduced hearing, muscle co-ordination and intellectual development. Lead contamination may also contribute either to lethargy or to aggressive behaviour.

If you have concerns and would like more information, contact your local office of the Department of Public Health or your medical doctor.

CAN I EAT VEGETABLES FROM MY GARDEN?

Lead enters and is stored in vegetables grown in lead-contaminated garden soils. The amount of lead taken up and stored in these vegetables will vary depending on the type of vegetable, the type of soil, your gardening practices and the amount of lead in the soil.

Although lead normally increases in plants as they age, lead is taken up and stored differently in roots and in plant leaves. For example, lettuce leaves can store seven times more lead than the roots of carrots. Beet leaves contain more lead than beet roots. Therefore, it is not always safe to assume that

root vegetables will contain more lead than leafy vegetables. Fruit crops such as tomatoes, berries, apples an cucumbers, present a much lower risk because they take up and store very little lead.

For most people, there is minimal risk in consuming home-grown vegetables at soil lead levels below 200 ppm. However, this is only a guide and it should be remembered that eating vegetables grown in soil contaminated with lead will always increase your exposure to lead and the risk to your health, especially for young children.

WHAT CAN I DO TO REDUCE EXPOSURE TO LEAD?

- Keep your children away from soil contaminated with lead. Contaminated soil can be removed, or exposure can be reduced by covering the soil with clean soil or sod. Soil can also be paved over or covered with paving stones or decking.
- Wash children's hands and faces after playing outdoors and before eating.
- Clean your home regularly using a damp mop or damp cloth. Vacuuming and sweeping can increase dust levels in the home. Use a phosphate cleaner at least once a week, especially near window sills and doors. Use rugs, curtains and slipcovers that can be cleaned easily.
- Have forced air ducts cleaned by professionals and replace furnace filters often.
- Avoid bringing outdoor dirt inside by removing outdoor shoes.
- Brush pets often as their fur collects dust. Pet should be brushed outside if possible.
- Keep children's toys and play areas clean; discourage mouthing activities such as eating dirt.
- Don't let your children eat paint chips. They like them because the lead in the paint makes the chip taste sweet.
- Locate your vegetable garden at least one metre (three to four feet) away from roads, driveways and down spouts. Also make sure your garden is at least a metre away from sources of flaking paint such as walls, sheds and fences.
- Before eating, wash all vegetables thoroughly and peel skin from root crops.
- If your soil is contaminated with lead, don't feed garden vegetables to young children or use them in baby food recipes.

HOW CAN I GET MORE INFORMATION?

If you live in the vicinity of a source of lead pollution and you suspect your soil may be contaminated, contact your local office of the Ministry of Environment and Energy.

Contact your local office of the Department of Public Health or your medical doctor if you are concerned about being exposed to lead or have questions about health effects.